

**What is Claimed Is:**

1. A valve assembly for conducting hyperpolarized gas, comprising:
  - a valve cover defining first, second, and third cover control gas ports;
  - a valve body defining
    - first, second, and third stepped piston bores opening on one major surface of said valve body, each said stepped piston bore defining a stem bore portion and a head bore portion;
    - first, second, and third body gas control ports in fluid communication with the head bore portion of said first, second, and third stepped piston bores, respectively,
    - first, second, and third breathing air ports in fluid communication with the stem bore portion of said first, second, and third stepped piston bores, respectively, and
  - an elongate fluid passageway opening on said valve body and in fluid communication with the stem bore portion of said first, second, and third stepped piston bores; and
  - a first, second, and third piston slideably supported in said first, second, and third stepped piston bore, respectively, each said piston including
    - a piston head received in the head bore portion of one of said first, second, and third stepped piston bores, said piston head sealing each said cover control gas port from its corresponding said body control gas port; and
    - an elongate piston stem received in the stem bore portion of said one of said stepped piston bores, said piston stem sealing each said body control gas port from its corresponding said breathing air port.
2. The valve assembly of claim 1, wherein at least one of said valve cover and valve head are formed from a thermoplastic material.
3. The valve assembly of claim 1, wherein said valve cover and valve body are formed from a thermoplastic material.

4. The valve assembly of claim 1, wherein said first air breathing port is in fluid communication with a source of breathing air, said second air breathing port is in fluid communication with a source of hyperpolarized gas, and said third air breathing port is in fluid communication with a vent to atmosphere.  
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5. The valve assembly of claim 1, wherein said first and second pistons are urged towards said cover so as to allow a hyperpolarized gas mixture to be inhaled by a subject.  
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6. The valve assembly of claim 5, wherein said third piston is urged away from said cover so as prevent exhaling by said subject.  
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7. The valve assembly of claim 1, wherein said first and second pistons are urged away from said cover so as to prevent a hyperpolarized gas mixture from being administered to a subject.  
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8. The valve assembly of claim 7, wherein said third piston is urged towards said cover so as to allow said subject to exhale.  
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9. The valve assembly of claim 1, further comprising a first gasket about each said piston head, a second gasket about each said piston stem, and a third gasket seated in each said stem bore portion, said first and second gaskets being slideable within said valve body and said third gaskets being stationary so as to be compressed by its respective piston stem when urged away from said valve cover and thereby fluidly isolating its respective air breathing port from said fluid passageway.